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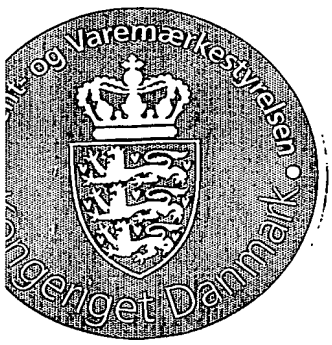

Patent- og Varemærkestyrelsen
Økonomi- og Erhvervsministeriet

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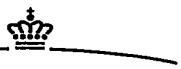

PATENT- OG VAREMÆRKESTYRELSEN

Method and adapter for protocol detection in a field bus network

FIELD OF THE INVENTION

The invention relates to a field bus adapter for transmitting and receiving control data from a field bus network where data is being exchanged according to a specific field bus protocol The adapter comprises a transmitter for transmitting data to the field bus network and a receiver for receiving data from the field bus network The invention further relates to a method for transmitting and receiving control data from a field bus network where data is being exchanged according to a specific field bus protocol The method comprises the step of transmitting data to the field bus network and the step of receiving data from the field bus network The invention also relates to a storage medium having stored thereon instructions for performing the method of transmitting and receiving control data from a field bus network where data is being exchanged according to a specific field bus protocol The method comprises the step of transmitting data to the field bus network and the step of receiving data from the field bus network

BACKGROUND OF THE INVENTION

Communication networks coupling input and output devices have been increasingly applied to many different control systems These input devices and output devices allow the controllers to receive and process local I/O functions, such as a measured physical value e g a temperature The devices communicate using bus communication also called field bus network communication

In control systems it is essential that the communication is performed reliably and within short time intervals This is e g important since fast and reliable data is often a must in order to obtain a satisfactory control Therefore, very strict requirements are set to answering times in field bus network communication, typically being much stricter than the requirements of communication busses used in standard IT systems

In a field bus communication network a variety of different field bus communication protocols can be used, including Profibus and Foundation Field bus One protocol is usually dedicated to a given control system or to a

network of control systems having the same type of control

A field bus adapter is dedicated to a specific network protocol so that the unit cannot be used on networks where a different communication protocol is used Thereby different network interface units for each different communication protocol are required

US 6151640 describes a field bus network of input and output devices being coupled to a control system through an I/O interface module, regardless of their data structures The I/O interface module is coupled to the control system through a serial communication port Local input and output devices are coupled to the interface I/O module through a local I/O interface, and networked input and output devices are coupled to the interface I/O module through a field bus communication adapter In this example a different adapter is required for each type of field bus protocol, not solving the problem of requiring specific units for specific network protocols

OBJECT AND SUMMARY OF THE INVENTION

It is an object of the present invention to provide a field bus adapter that can be used together with different field bus protocols

This is obtained by the fact that the adapter further comprises a protocol detector adapted for detecting the field bus protocol and setting up the receiver and transmitter for communicating, according to said detected field bus protocol Thereby the same field bus adapter is compatible with a number of different communication protocols Adapters communicating in a field bus network using a first protocol can then be used for communicating in another field bus network using a different protocol This makes the adapter more interesting for the potential buyers Further, for the producer of the adapters it is an advantage that only one production line is necessary instead of a number of production lines producing adapters being specific for each field bus protocol The adapter of the present invention also makes it easy for the user since it is not necessary to know exactly which field bus protocol is being used, instead the adapter can be connected and then the field bus protocol is automatically detected and used

In a specific embodiment, the protocol detector comprises means for detecting characteristics of the data on the field bus network, said characteristics identifying the protocol This is an easy and fast way of detecting a protocol

In a specific embodiment, the protocol detector comprises a frame checker and the characteristics are comprised in the data frame of the data being transmitted on said field bus network It is the data frame that separates one protocol from another and therefore it is an easy way of detecting the protocol

In an embodiment, the control data to be transmitted is a value representing a measured physical value The physical value could be either temperature, speed, and/or distance and the physical value is then used for controlling a process performed by a control unit connected to the field bus network

In a specific embodiment, the adapter comprises means for measuring said physical value Thereby the adapter comprises the measuring means or the transducer and the adapter is dedicated for a specific purpose, making the adapter easy to install and making it easier to optimize the adapter for the specific purpose

The object of the present invention is also obtained by a method comprising the step of detecting the field bus protocol and setting up the receiver and transmitter for communicating according to the detected field bus protocol

BRIEF DESCRIPTION OF THE DRAWINGS

In the following, preferred embodiments of the invention will be described referring to the figures, where

figure 1 shows a number of field bus adapters connected to a field bus network,

figure 2 is a flow diagram illustrating the step of detecting a protocol,

figure 3 shows the different elements in an embodiment of a field bus adapter

DESCRIPTION OF PREFERRED EMBODIMENTS

Figure 1 shows an example of a control system The control system comprises a number of field bus adapters 101 communicating across a field bus network 103 The field bus adapters could be connected to a number of different types of transducers for measuring physical values such as temperature, speed, and/or distance These measured values are transmitted via a transmit channel 107 to e g a control computer via the field bus network, where the control computer e g could use the received values for controlling a process The adapters 101 might also receive information (via a channel 105) such as a control signal indicating that the physical value should be measured and transmitted

When communicating across a field bus network, different communication protocols can be used and examples of field bus communication protocols are Profibus PA and Foundation field bus Normally a protocol is chosen when setting up the control system and then all devices communicating via the field bus network use the selected protocol

Figure 2 is a flow diagram illustrating the step of automatically detecting a protocol The field bus adapter is connected to a field bus network and in 201 the adapter receives a data package via the field bus network The data package could either be a package, which is intended for the specific field bus adapter, or it could be any package being transmitted via the field bus network In 203 the adapter checks the package and detects the protocol The protocol could e g be determined by checking the data frame of the received data package, which uniquely identifies the protocol, e g when communicating according to the protocol Profibus PA one frame is being different from the frame used when communicating according to the Foundation field bus protocol Information about each protocol could be stored in the field bus adapter and this information can then be compared to the information obtained by checking the frame of the received data package, whereby the protocol can be identified

In 205 the result of the check in 203 is used to determine the next step in the algorithm, and if the protocol has been detected as a protocol referred to as T1 then in 207 the instructions are extracted from the package according to rules defined by the protocol T1 In 209 actions are performed according to the extracted instructions and in 211 all future communication via the field bus network will be performed according to the detected protocol T1 The future communication could be performed by receiving a data packet via the field bus network, extracting information according to T1 and performing an action according to the extracted information The future communication could also be encoding instructions to be transmitted using the protocol T1 and then transmitting the encoded instructions If the protocol has been detected as a protocol referred to as T2, then in 215 the instructions are extracted from the package according to rules defined by the protocol T2 In 217 actions are performed according to the extracted instructions and in 219 all future communication via the field bus network will be performed according to the detected protocol T2 Also, in this case the future communication could be performed by receiving a data packet via the field bus network, extracting information according to T2 and performing an action according to the extracted information The future communication could also be encoding instructions to be transmitted using the protocol T2 and then transmitting the encoded instructions T2 and T1 could e g be respectively Profibus PA and Foundation field bus

A further possibility is that in 203 it is not possible to detect the protocol, which could be because of an error in the received data package, and thus the detection process is restarted using a new data package for protocol detection

In figure 3 an embodiment of a field bus adapter is illustrated showing the different elements in a field bus adapter The field bus adapter is connected to the field bus network 301 via a receiver 303 and a transmitter 311 The receiver could then be connected to an analog filtering unit 305 for filtering and restoring the received data package The received data is then ready to be processed according to the algorithm illustrated in figure 2, where a microcomputer 307 could perform the steps of detecting the protocol according to 203 and 205 shown in figure 2 The microcomputer could

comprise a microprocessor 313 and some memory 315 communicating via a communication bus 317 The field bus adapter could also be adapted for receiving data from different types of transducers for measuring physical values such as temperature, speed, and/or distance, and the received data is then the measured physical value In an embodiment the transducer is connected to the microcomputer 307 in the field bus adapter via an analog filtering unit for filtering and restoring the data received from the transducer

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CLAIMS

1 A field bus adapter for transmitting and receiving control data from a field bus network where data is being exchanged according to a specific field bus protocol, said adapter comprises a transmitter for transmitting data to the field bus network and a receiver for receiving data from the field bus network characterised in that the adapter further comprises a protocol detector adapted for detecting the field bus protocol and setting up the receiver and the transmitter for communicating according to said detected field bus protocol

2 A field bus adapter according to claim 1, wherein the protocol detector comprises means for detecting characteristics of the data on the field bus network, said characteristics identifying the protocol

3 A field bus adapter according to claim 2, wherein the protocol detector comprises a frame checker and the characteristics are comprised in the frame of data being transmitted on said field bus network

4 A field bus adapter according to claim 1-3, wherein the control data to be transmitted is a value representing a measured physical value

5 A field bus adapter according to claim 1-4, wherein said adapter comprises means for measuring said physical value

6 A method for transmitting and receiving control data from a field bus network where data is being exchanged according to a specific field bus protocol, said method comprises the step of transmitting data to the field bus network and the step of receiving data from the field bus network characterised in that the method further comprises the step of detecting the field bus protocol and setting up the receiver and transmitter for communicating according to the detected field bus protocol

7 A method according to claim 6, wherein the protocol is detected by detecting characteristics of the data on the field bus network, said characteristics identifying the protocol

8 A method according to claim 7, wherein the detected characteristics are comprised in a data frame on the data being transmitted on the field bus network, said data frame being individual for each protocol

9 A method according to claim 6-8, wherein the step of detecting the field bus protocol and setting up the receiver and transmitter for communicating according to the detected field bus protocol only is performed in an initialisation phase before transmitting and receiving control data via said field bus network

10 A method according to claim 6-8, wherein the step of detecting the field bus protocol is performed periodically in predefined intervals

11 A storage medium having stored thereon instructions for performing the method of claim 6-10

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ABSTRACT

The present invention relates to a field bus adapter for transmitting and receiving control data from a field bus network where data is being exchanged according to a specific field bus protocol, said adapter comprises a transmitting part for transmitting data to the field bus network and a receiver part for receiving data from the field bus network. The adapter further comprises a protocol detector adapted for detecting the field bus protocol and setting up the receiver and transmitter for communicating according to the detected field bus protocol. The invention further relates to a method for transmitting and receiving control data from a field bus network according to the above

(Fig 2)

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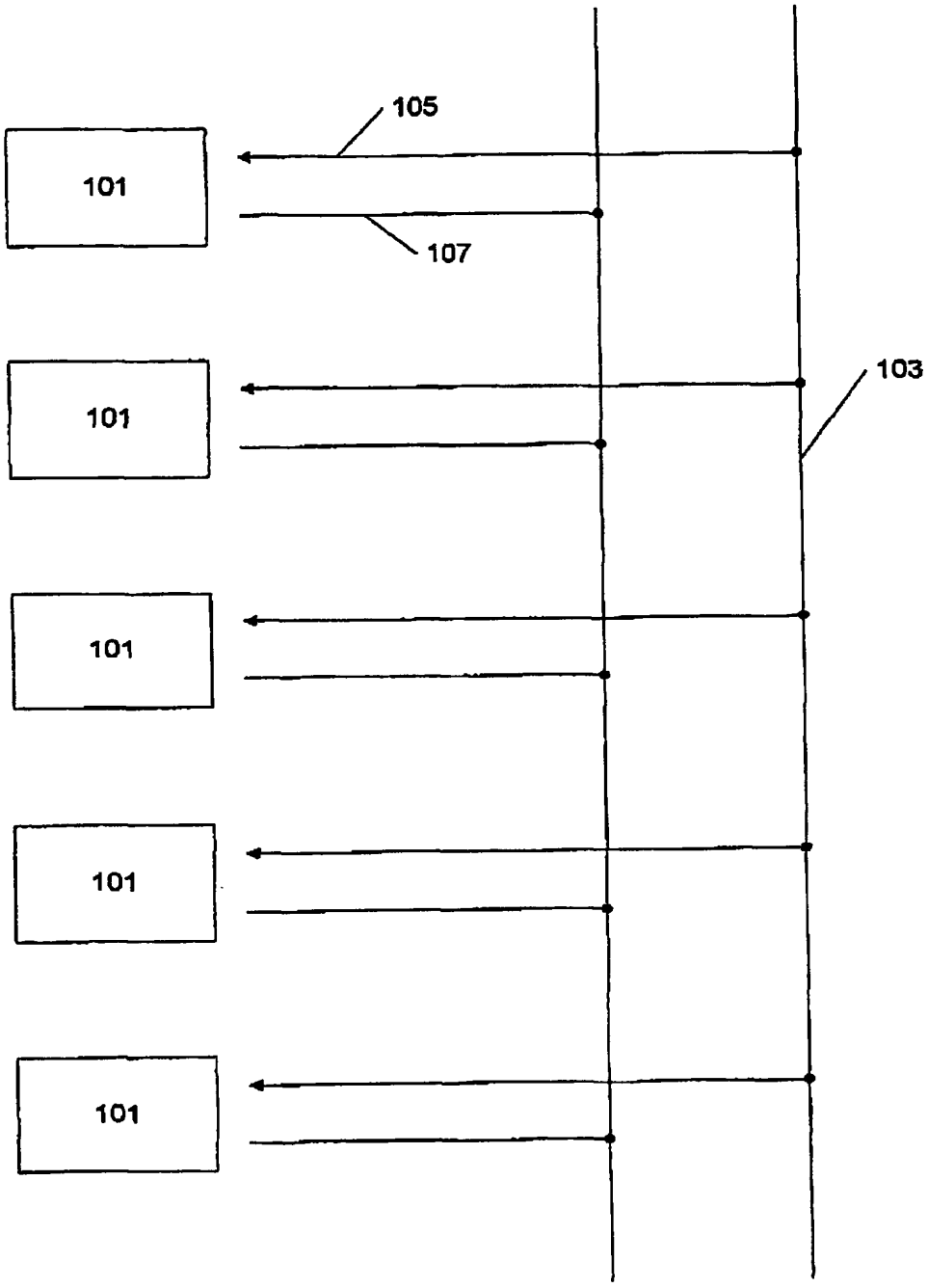

Fig 1

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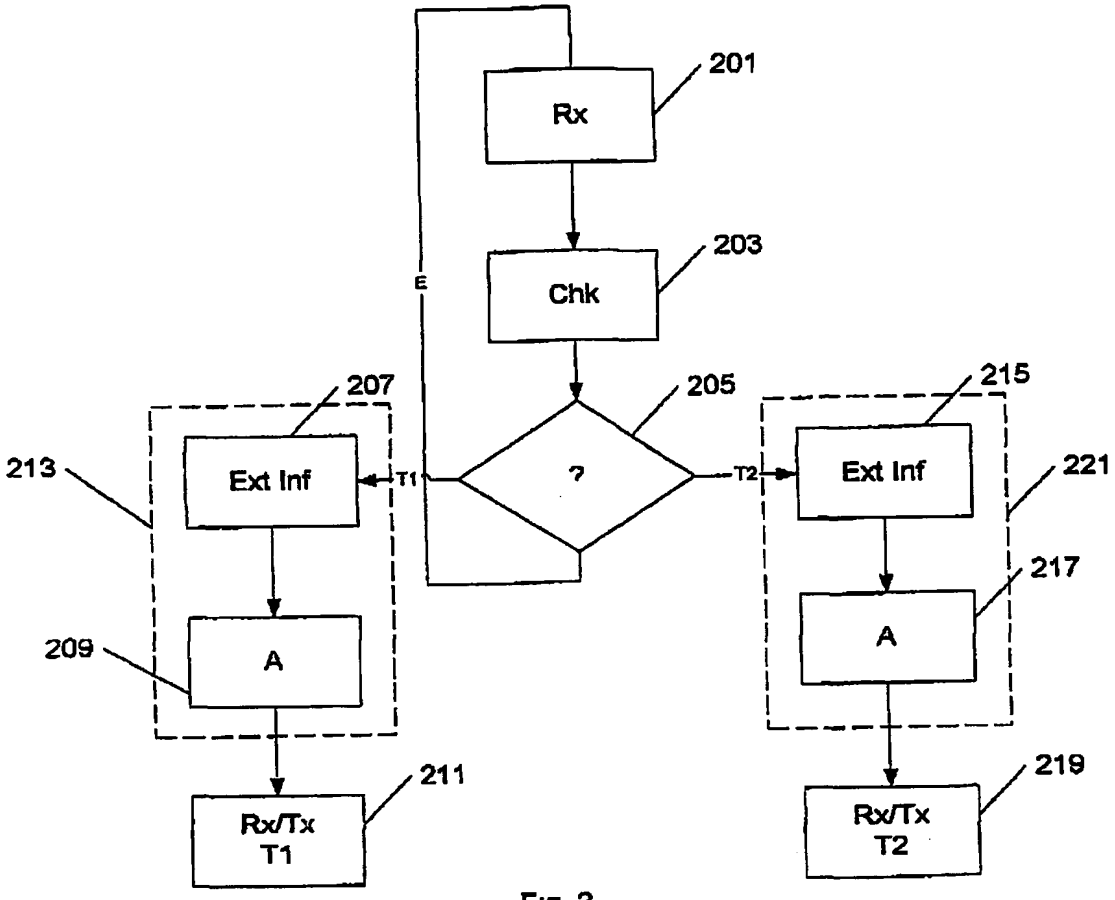

Fig 2

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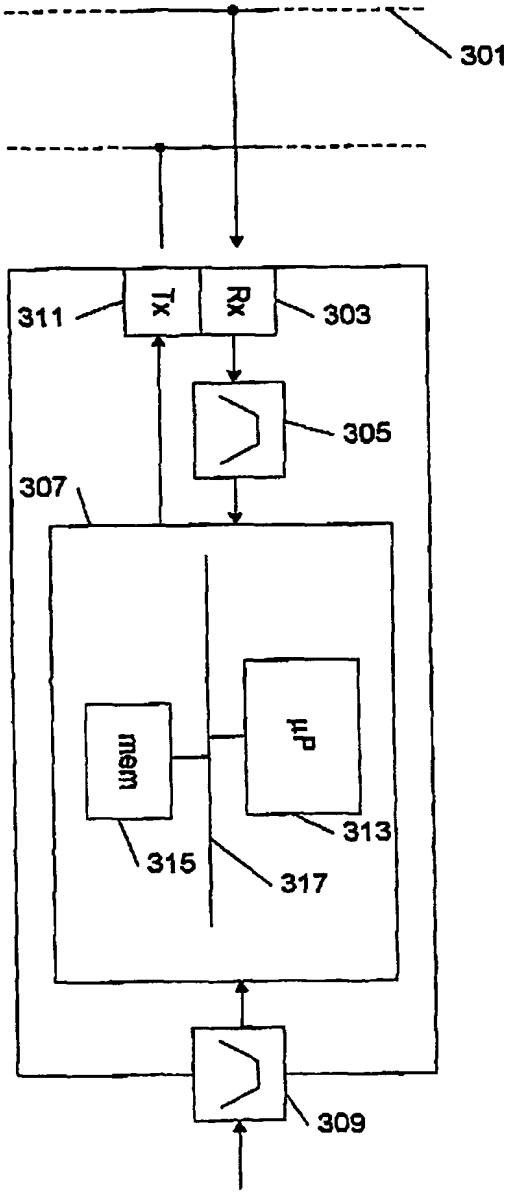

Fig 3